



**BOGEN**<sup>®</sup>  
A DIVISION OF LEAR SIEGLER, INC.

## *Flex-Pak* AMPLIFIERS

CHS-35A/60A/100A

Bogen Flex-Pak CHS-A series public address amplifiers are fully transistorized preamplifier-mixer-amplifier units, rated at 35 watts in Model CHS-35A, 60 watts in Model CHS-60A, and 100 watts in CHS-100A.

Two input channels are provided for high-impedance or low-impedance unbalanced microphone inputs. Both channels may be converted for use with low-impedance balanced microphone inputs by means of Bogen plug-in transformer accessories. One of these channels may also be used for

magnetic phono or tape head inputs. An optional accessory designed to mount on the front panel of the amplifier provides two additional microphone input channels. These added channels have all the capabilities of the basic channels, and the same accessories are applicable to them.

Two auxiliary channels, with separate controls, are provided on the amplifier for a tuner, tape recorder, or phonograph with a ceramic cartridge.

### TECHNICAL SPECIFICATIONS

	CHS-35A	CHS-60A	CHS-100A
<b>POWER OUTPUT (RMS at 1000 Hz)</b>	35 watts	60 watts	100 watts
<b>FREQUENCY RESPONSE</b>	± 2 dB 70 Hz to 12 kHz		
<b>HUM &amp; NOISE (below rated output)</b>	MIC, 60 dB; AUX 70 dB		
<b>SENSITIVITY (for rated output)</b>	AUX, 0.15 V; Hi Z MIC, 3 mV; Low Z unbalanced, 0.3 mV; Low Z balanced, 0.3 mV		
<b>OUTPUTS</b>	8 & 16 ohms 25 V (18 ohms) CT 70 V (140 ohms)	8 & 16 ohms 25 V (10.4 ohms) CT 70 V (82 ohms)	4 & 16 ohms 25 V (6.25 ohms) CT 70 V (49 ohms)
	TAPE OUT, 650 mV at 1k ohms; TAPE/BOOSTER, 5 V at 10k ohms; WMT-1 output 500/600 ohms; Reverb output, 650 mV at 1 k ohms		
<b>OUTPUT CONNECTIONS</b>	2 Quick disconnect type sockets with plugs provided, in addition to screw-type terminals, tape/booster jack, and provisions for WMT-1		
<b>INPUTS</b>	2 Hi Z (50k) MIC inputs each. Convertible to Low Z unbalanced (300 ohms) and Low Z balanced with plug-in accessory transformers. 2 AUX (500k); Reverb input (20k); MIC 2 convertible to magnetic input (50k).		
<b>LINE FUSING</b>	Resettable Circuit Breaker		
	.93 A Hold	1.65 A Hold	2.5 A Hold
<b>TONE CONTROL ACTION</b>	BASS 50 Hz + 9 dB to -12 dB; TREBLE 12 kHz +9 dB to -12 dB		
<b>CONTROLS &amp; INDICATORS</b>	MIC 1, MIC 2 Volume; AUX 1, AUX 2 Volume; MASTER Volume; BASS; TREBLE; Power Switch; Indicator Lamp		
<b>SEMICONDUCTORS</b>	11 Silicon Transistors	11 Silicon Transistors	13 Silicon Transistors
	1 Zener Diode, 4 Silicon Diodes		
<b>POWER CONSUMPTION</b>	120 vac, 60 Hz		
	0.86A, 96W	1.6A, 170W	2.5A, 300W
<b>DIMENSIONS</b>	16-3/8" W x 13-3/4" D x 4-1/4" H		
<b>WEIGHT</b>	20 lbs.	23 lbs.	26 lbs.

One microphone channel and the auxiliary channels may be remotely controlled or overridden (via optional accessories) for special announcements over another microphone channel.

IN and OUT receptacles are provided for easy connection of a reverb unit or acoustic equalizer filters to the amplifier.

Provision is made for using a transformer accessory to feed a signal from a 500/600 ohm telephone line into the amplifier or to connect the output of the amplifier to a 500/600 ohm telephone line.

The output of the amplifier can also be connected from the tape/booster jack to a tape recorder or booster amplifier.

A tape out jack provides for making tape recordings independent of the amplifier master volume and tone controls.

## INSTALLATION

### UNPACKING

The amplifier was carefully checked before leaving factory. Inspect shipping container and unit carefully for indication of improper handling. If the unit has been damaged, make an immediate claim to distributor from whom it was purchased. If the amplifier was shipped to you, notify transportation company without delay and place your claim.

### POWER AND GROUNDING

The amplifier is furnished with an ac line cord terminated in a three-prong plug. The line cord should be plugged into a three-wire grounded outlet providing a nominal 120-volt, 60 Hz power source. This will ground the amplifier as well as supply power to it.

It is important to ground the amplifier. Therefore, if a three-wire outlet is not available, an adapter such as Leviton No. 5017 should be used to convert a standard two-wire outlet for use with three-wire plugs. The adapter is provided with a grounding pigtail which should be connected to the screw holding the wall plate to the receptacle.

In some areas, the wall plate screw is not grounded. In this case it will be necessary to connect a grounding wire from the GND terminal on the rear chassis of the amplifier to a water or steam pipe.

### AUXILIARY POWER

The auxiliary power receptacle on the rear chassis (see figure 1) is a three-wire grounded outlet, which can supply power to accessory sound equipment. When connecting associated equipment with a three-prong cord, appropriate grounding is accomplished when the amplifier line cord is properly grounded.

Use the ON/OFF switch on the phonograph for turning off a record player connected to the auxiliary receptacle, as use of the amplifier power switch could cause flats to develop on the idler wheel of the phonograph.

### CAUTION

*Be sure that the auxiliary components do not draw more than 250 watts on the CHS-35A and CHS-60A, and 500 watts on the CHS-100A.*

## INPUT CONNECTIONS

**HIGH IMPEDANCE MICROPHONES:** The amplifier is shipped in a configuration for direct connection of high impedance microphones (50k ohms) to the two MIC input receptacles of the amplifier. The microphone lead should be

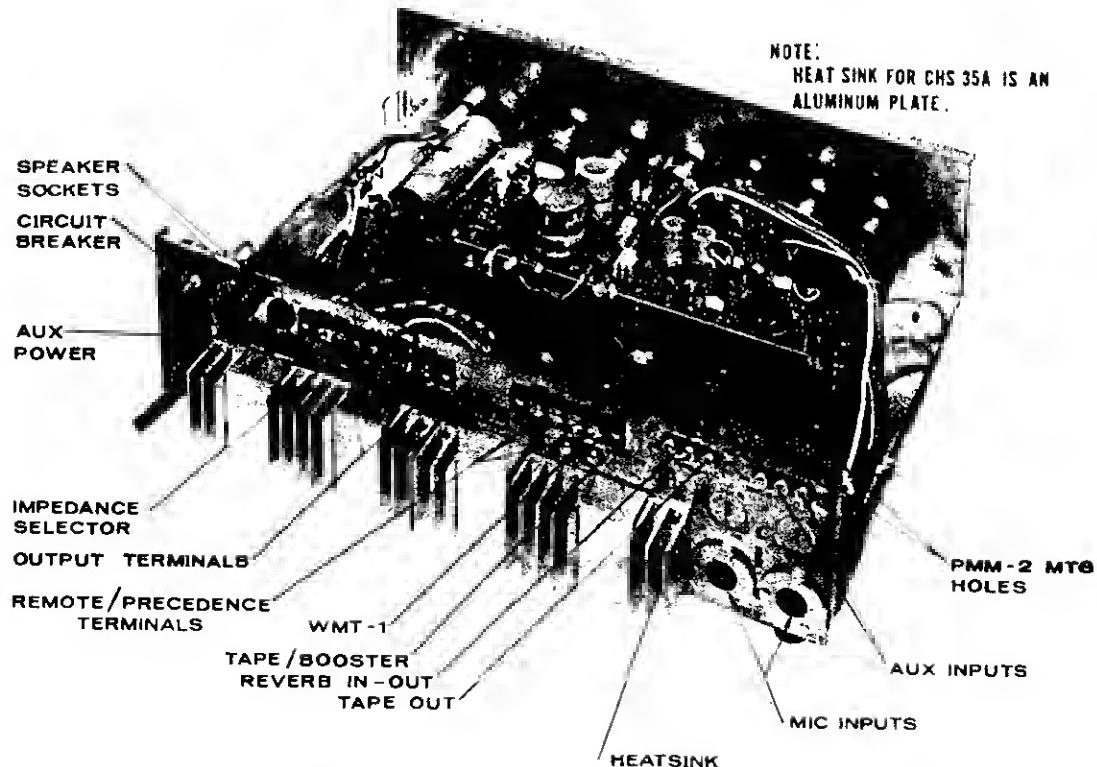


Figure 1—Rear Panel and Top Chassis of Amplifier

a single-conductor shielded cable under 35 feet long and terminated in a Cannon XLR-311C connector (Bogen Part No. 85-0124-01) as shown in figure 2.

In the event jumpers on the printed circuit board have been rearranged, and a return to the configuration for direct connection of high impedance microphones is desired, connect the two jumpers as follows: the first jumper between terminals 10 and 13 and the second between terminals 11 and 16. Three jumpers are not utilized and are stored by connecting both ends to an assigned terminal—the first jumper to terminal 14, the second to 17 or 19 and the third to 26.

**UNBALANCED LOW IMPEDANCE MICROPHONES:** Jumpers with push-on connector lugs are mounted on the printed circuit board assembly for use in converting the MIC input channel circuits. See note 5 on the schematic diagram, figure 3. To convert MIC 1 for unbalanced low impedance use, connect jumper between pins 14 and 15; to convert MIC 2, connect jumper between 17 and 18. As shown in figure 2, make and connect a jumper between terminals 1 and 2 of the microphone plug, with the shield connected to pin 1. Connect the conductor lead of the microphone to pin 3 of the plug.

**BALANCED LOW IMPEDANCE MICROPHONES:** Low impedance transformer accessories are required to permit the amplifier to accept inputs from microphones rated at 50, 200, or 500 ohms. Use a two-conductor shielded cable for the microphone lead, terminated in a Cannon XLR-311C connector, as shown in figure 2. Before connecting microphone, insert appropriate plug-in transformers and modify connections to transformer sockets as described in the Accessories Section. Plug-in transformers are furnished with holdown springs which should be used to keep the transformer in place. Locate 2 square holes on either side of transformer receptacle, place spring directly over transformer and lock ends into these holes.

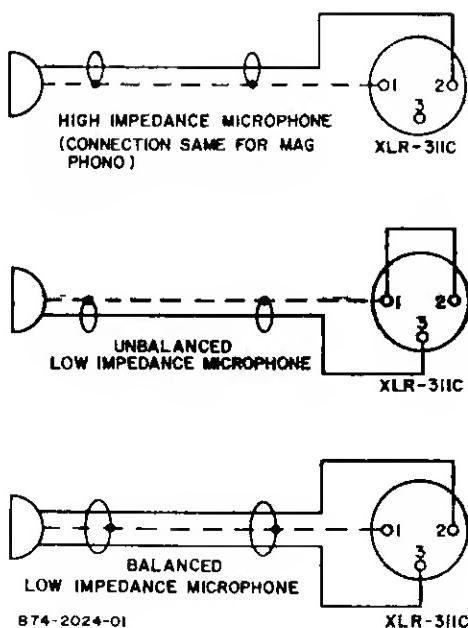


Figure 2—Wiring Microphone Cable Connector

**AUXILIARY INPUTS:** Two auxiliary inputs with separate controls are provided for high-level, high impedance inputs. These may be used to connect a radio tuner, tape recorder, record player utilizing a ceramic cartridge, or WMT-1 telephone line matching transformer. An input signal of 0.15 volts is required to obtain full output from the amplifier.

Use single-conductor shielded cable terminated in an RCA phono plug for connecting auxiliary component. If hum is experienced after making connections, run a ground wire between the chassis of the auxiliary unit and the GND terminal of the amplifier.

**MAG PHONO:** The output of a phonograph employing a magnetic cartridge may be connected to the MIC 2 input receptacle on the rear panel. Use a single-conductor shielded audio cable terminated in a Cannon XLR-311C connector as shown in figure 2 (connections same as high impedance mic). A magnetic tape head may also be connected in this manner.

To provide the necessary equalization for magnetic phono and tape head inputs, the Berg-terminal jumpers on the printed circuit board must be connected, as indicated in note 4 on the schematic diagram, figure 3. Connect a jumper between pins 18 and 19 and between pins 25 and 26.

#### NOTE

The MIC 2 input receptacle is designed to accept the output of the playback head of a tape transport mechanism without electronics, provided jumpers are connected as indicated for mag pickup, and a second such input is available when PMM-2 is used. A standard tape deck or tape recorder with built-in preamplifier should be connected to either of the AUX input receptacles.

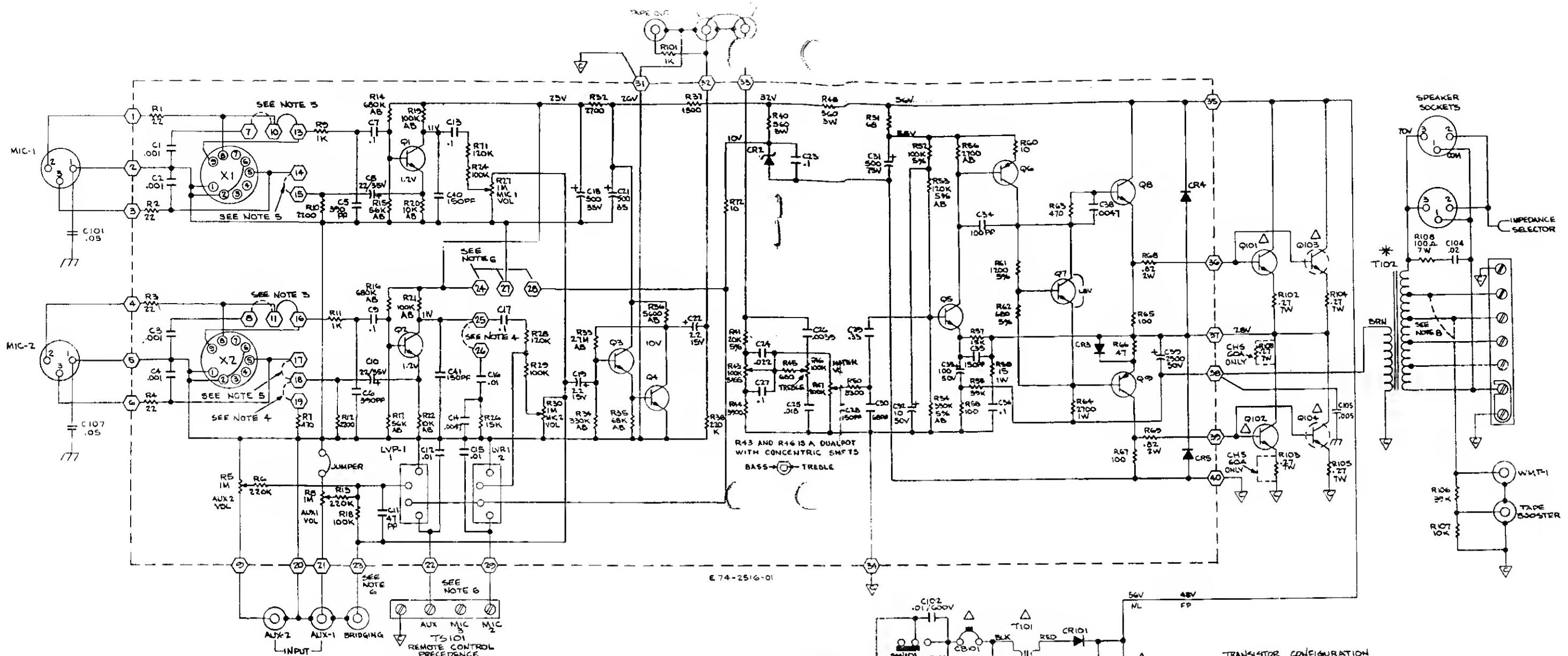
## OUTPUT CONNECTIONS

**SPEAKERS:** The amplifier may be used with most conventional speaker systems. For detailed information on the installation of multiple speaker systems, refer to the Speaker Installation Bulletin (No. 54-5001) included with this unit.

In permanent installations, where speakers will remain connected to the amplifier, connect the speaker system directly to the Speaker Output terminals on the rear of the amplifier. Connect one speaker lead to the COM terminal and the other to the terminal corresponding to the impedance of the speaker system. For balanced output lines, remove the link between COM and GND output terminals. If the line is shielded, connect the shield to GND. The 70-volt output is available only through the 3-pin connectors.

#### CAUTION

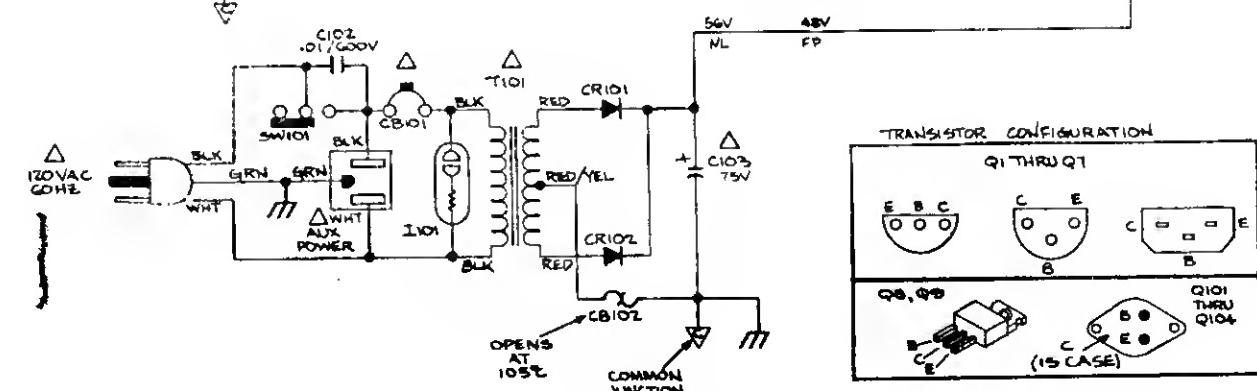
To minimize shock hazard, Class 1 wiring as defined in local building codes should be used for 70-volt outputs. All other outputs may use Class 2 wiring.



NOTES:

- 1-UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE  $1/2W \pm 10\%$ , CAPACITORS ARE IN MF.D AND MIC INPUTS ARE IN HI Z MODE.
- 2-REMOVE LINK FOR REVERB OR ACOUSTIC EQUALIZER FILTER ACCESSORIES.
- 3-FOR BALANCED LOW-IMPEDANCE MIC INPUTS PLUG IN TM TRANSFORMERS IN APPROPRIATE X1 OR X2 SOCKETS. FOR MIC1 SWITCH JUMPER FROM PIN 13 TO PIN 7. FOR MIC2 SWITCH JUMPER FROM PIN 16 TO PIN 8.
- 4-TO CONVERT MIC 2 INPUT INTO A MAG PHONO INPUT, CONNECT JUMPER BETWEEN PINS 18 AND 19; 25 AND 26.
- 5-FOR LOW-Z UNBALANCED INPUT CONNECT JUMPER BETWEEN PINS 14 AND 15. FOR MIC1 AND 17;18 FOR MIC2. CONNECT JUMPER BETWEEN 1 AND 2 OF YOUR MICROPHONE PLUG. CONNECT THE CONDUCTOR LEAD OF YOUR MICROPHONE TO PIN 3.
- 6-WHEN USING ADD-ON PREAMP(PMM-2), CONNECT LEAD FROM PIN 3G ON PMM-2 TO MICS ON TS101 (REMOTE CONTROL PRECEDENCE). USE PINS 23,24,27,28 FOR PMM-2 ACCESSORY.
- 7-UNLESS OTHERWISE SPECIFIED ALL VOLTAGES ARE +DC NL MEASURED TO GROUND WITH A V.T.M. AND MAY VARY  $\pm 20\%$ .
- 8-WIRE CONNECTED TO ORANGE OUTPUT TRANSFORMER LEAD ON ALL AMPLIFIERS.
- 9-// DENOTES CHASSIS CONNECTION.

MODEL	PWRLINE CURRENT	AUX. POWER	C101 HOLD CURRENT	T101	OUTPUT TRANSISTORS	C103
CHS35A	.61A	250W	.55A	83-755-000	Q101, Q102	1500
CHS60A	1.1A	250W	1.65A	84-754-000	Q103, Q102	2000
CH100A	2.5A	300W	2.5A	84-755-000	Q101-Q104	3000



OUTPUT TERMINALS

T102	CHS 35A 83-428-000	CHS 60A 83-429-000	CHS 100A 83-430-000
GRN / WHT	70V / 140 $\Omega$	70V / 82 $\Omega$	70V / 49 $\Omega$
ORN	25W 18 $\Omega$	25V / 10.4 $\Omega$	25V / 6.8 $\Omega$
GRN	16 $\Omega$	16 $\Omega$	16 $\Omega$
YEL	8 $\Omega$	8 $\Omega$	—
BLK / ORN	25VCT / 4.45 $\Omega$	25VCT / 2.6 $\Omega$	25VCT / 1.56 $\Omega$
BLK / YEL	—	—	4 $\Omega$
BLK	COM	COM	COM

Figure 3—Schematic Diagram, CHS-A Amplifiers

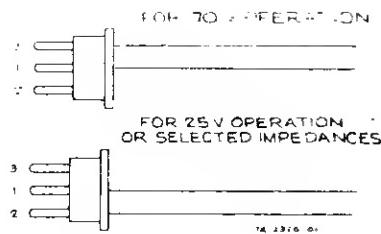


Figure 4—Speaker Output Plug Wiring

For frequently moved installations, connect the speaker to the speaker sockets on the rear panel. Two quick-disconnect plugs (Bogen Part No. 85-0147-01) are furnished with the amplifier to make connections to these sockets. Wiring of the speaker output plug is shown in figure 4.

When the speaker socket is used, connect the wired plug to either socket. Attach the impedance selector lead to the output terminal which corresponds to the speaker system impedance. For 70-volt operation, it is only necessary to connect the wired plug to either quick-disconnect speaker socket, leaving the impedance selector disconnected. Note that the arrangement in figure 4 is for unbalanced speaker lines, with the link between COM and GND closed. For balanced lines, open the link between COM and GND.

**TAPE OUTPUT:** A tape recorder may also be driven from the TAPE OUT jack on the amplifier. In this case, the output is not subject to the volume or tone setting of the amplifier and is controlled at the tape recorder. A patch cord terminated in a standard phono plug is connected between the TAPE OUT jack on the amplifier and the input of the tape recorder.

**REVERB/ACOUSTIC EQUALIZER FILTERS:** Provision is made to insert a reverb unit or acoustic equalizer filters unit into the amplifier signal path, using the IN and OUT jacks at the rear of the amplifier. Remove the link connecting these two jacks. Connect a patch cord with a standard phono plug from the IN jack to the input of the reverb or acoustic equalizer filters, and a similar patch cord from the output of the reverb or acoustic equalizer filters to the OUT jack on the amplifier. All input signals to the amplifier will be affected by the reverb or acoustic equalizer filters operation.

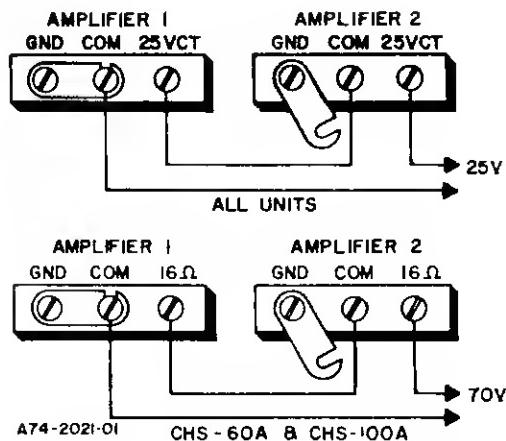


Figure 5—Connecting Amplifiers in Series

#### CONNECTING AMPLIFIERS IN SERIES

Pairs of the same amplifier models can be connected in series to effectively double the power output into the same loadline. See figure 5 for connection diagram. Be certain to remove the link between COM and GND of amplifier No. 2.

Connect a single-conductor shielded cable, terminated in an RCA phono plug at each end, between the rear panel BRIDGING receptacles of both amplifiers. This assures that any input from any mic or channel will have equal amplification.

It is preferable that both amplifier tone and master volume controls be at the same setting to assure that each amplifier will share the load equally.

## OPERATION

**POWER:** This switch applies power to the amplifier. It will also turn on any associated equipment which may be connected to the auxiliary power receptacle on the rear panel. The POWER indicator lamp will go on to show that power has been applied to the unit.

**VOLUME:** Individual volume controls are used to adjust the two MIC input channels, the two AUX input channels and for Master volume control. Turn each control clockwise (to the higher numbers) to increase volume. In adjusting these controls, it is recommended that each MIC and AUX control be set to the highest level likely to be used, and regulate overall volume with the Master control.

**BASS/TREBLE:** Concentric knobs control these functions. The outer or larger knob is the BASS control and the inner or smaller knob is the TREBLE control.

Use the BASS control to adjust the tonal balance of the amplifier output. Rotation in the counterclockwise direction reduces the bass response. It may also be used to remove low-frequency noise such as phono rumble or hum. In situations where acoustic feedback is likely, rotate the BASS control counterclockwise to reduce the feedback and to obtain higher volume levels than would otherwise be possible.

Rotation of the TREBLE control counterclockwise reduces the high frequency response of the amplifier. It may also be used to remove high-frequency noise, such as record scratch.

## ACCESSORIES

#### CAUTION

The installation of plug-in accessories requires the removal of the cover, which presents an electrical shock hazard. For this reason, these accessories should be installed by qualified technicians only.

**PMM-2 MICROPHONE MODULE:** The Bogen PMM-2 Microphone Module is a preamplifier designed to provide two additional microphone channels for the amplifier. Each preamplifier channel has its own volume control and will accommodate either high impedance or balanced or unbalanced low impedance microphones. These added

channels have all the characteristics of the basic channels, and the same accessories are applicable to them. The unit is installed and connected as described in the instruction manual furnished with the PMM-2 accessory.

**MIC INPUT TRANSFORMERS:** Bogen TM50, TM200, and TM500 plug-in transformer accessories are designed to match the input impedance of the amplifier to a low impedance microphone. The Model TM50 is intended for microphones of 50 ohms impedance, the TM200 for 200-ohm mics, and the TM500 for 500/600-ohm mics. To convert either of the microphone inputs to balanced low impedance use, proceed as follows:

1. Remove the amplifier cover by loosening four screws on each side and lifting it away from the chassis.
2. Note that the printed circuit board, now accessible, has two nine-pin accessory sockets (X1 for MIC 1, and X2 for MIC 2). Plug the selected TM transformer into the appropriate socket if you wish to convert either or both of these MIC inputs to low impedance use.
3. Secure transformers firmly in place on accessory sockets by means of spring clips, Bogen Part No. 02-9078-01, furnished with the transformers.
4. For MIC 1 conversion connect jumper between pins 7 and 10. For MIC 2 conversion, connect jumper between pins 8 and 11. See note 3 on the schematic diagram, figure 4.

**LVP-1 (MIC PRECEDENCE):** The Bogen LVP-1 is a plug-in accessory which provides microphone precedence over the MIC 2 input channel, and the AUX 1 and AUX 2 inputs. Remove the amplifier cover as described above. To mute the MIC 2 channel, plug an LVP-1 into the socket on the printed circuit board marked MIC LVP-1. To mute the AUX channel, plug another LVP-1 into the adjacent socket marked AUX LVP-1.

For detailed information on MIC precedence connections, see the instruction sheet furnished with the LVP-1 accessory.

**LVP-1 and RVC-2A (REMOTE VOLUME CONTROL):** Plug an LVP-1 accessory into each channel to be remotely controlled, as described above. Connect the RVC-2A remote volume control to the Remote Control Precedence terminal strip on the rear of the amplifier. Connect one lead from the accessory to the appropriate MIC2 or AUX terminal and the other lead to GND. Complete installation instructions are supplied with the RVC-2A accessory.

**WMT-1 TELEPHONE LINE:** The Bogen Model WMT-1 input/output matching transformer is an accessory which has been designed especially for matching either inputs from or outputs to a 500/600-ohm line. As an input matching transformer, it may be used with the Bogen amplifier for distributing background music which has been transmitted over leased telephone lines. The accessory also functions as an output matching transformer in feeding special program material over a 500/600-ohm telephone line for transmission to a local broadcast studio.

**CFC ACOUSTIC FEEDBACK CONTROLLER:** The Bogen Model CFC is a 2/3 Octave Equalizer incorporating 10 active 2/3 octave band filters. The CFC can be used with the CHS-A Amplifiers by removing the Reverb/Equal Link from the rear of the Amplifier and connecting the CFC Aux Input and Output to those phono jacks.

**LPC-4A PHONO PLAYER:** The Model LPC-4A is an ac-operated three-speed record player top, designed for mounting on the amplifier.

**LK-12 CONTROL GUARD LOCKING PLATE:** The Bogen Model LK-12 is designed to prevent unauthorized tampering with the controls of the amplifier. It comes complete with two sets of keys.

**CC12S CARRYING CASE AND SPEAKER:** (For use with CHS-35A and CHS-60A only.) A Bogen Model CC12S carrying case with two speakers is available for portable systems. Each section of the case contains a high-efficiency 12-inch PM speaker and 25 feet of interconnecting cable with plug.

**RPK-33A RACK PANEL:** The Model RPK-33A is designed to mount the amplifier (with or without the PMM-2 preamplifier) in a standard 19-inch sound rack. The rack panel is finished in gray enamel.

## MAINTENANCE

### CAUTION

*There are no user replaceable parts within the unit. Have all internal servicing done by a qualified technician.*

### BOGEN SERVICE

We are interested in your Bogen equipment for as long as you have it. If trouble ever develops, do not hesitate to ask our advice or assistance. Information can be obtained by writing to Service Department, Bogen Division, P.O. Box 500, Paramus, N.J. 07652.

When communicating with us, give the model and series designation of your unit. Describe the difficulty and include details on the electrical connections to associated equipment, and list such equipment. When we receive this information, we will send you service information if the trouble appears to be simple. If the trouble requires servicing, we shall send you the name and address of the nearest Bogen authorized service agency to which you can send your unit for repairs.

When shipping your unit, pack the amplifier well, using the original shipping carton, or a similar container and filler material, to prevent damage in transit. Send the unit, fully insured and prepaid, via UPS if available, or other responsible carrier. The unit will be promptly repaired and returned to you collect.

### CIRCUIT BREAKER

If the circuit breaker opens, the ac power lamp will go out and the amplifier will have no output, but there will be power at the AUX POWER receptacle at the rear panel. Set the ac power switch to off and momentarily depress the red button on the circuit breaker to reset it. Return the ac power switch to on. If the breaker trips again, do not attempt to reset it but have the trouble investigated by a qualified technician.

### THERMAL BREAKER

If the thermal breaker opens, there will be no audio output but the ac power lamp will remain on. Wait approximately two minutes for the breaker to reset. If the breaker resets and then opens again, investigate the cause of the temperature overload. This may be due to improper connections at the output terminals or to excessive environmental heat with inadequate ventilation. The thermal

breaker will open when the temperature at the output transistor heat sink reaches 105°C (221°F) on all models.

### REMOVING PC BOARD FOR SERVICING

Remove the front panel knobs and nuts over the bushings of the front panel controls.

Three nylon standoffs are used to support the rear of the PC board. Progressively disengage the three standoffs at the rear by raising the edge of the board with one finger, while depressing the locking tab on the standoff with a screwdriver blade.

### REPLACING TRANSISTORS

When replacing the driver transistors, press a small screwdriver blade into the side of the U-clip heat sink to spread the jaws of the clip. Draw the clip and screwdriver off the metal tab on the driver transistor. Reverse the procedure to install the clip on the replacement transistor. Since the U-clip heat sink is a spring clip, avoid spreading the jaws too wide.

When replacing the output transistors, clean all foreign matter from the heat sink, insulator, and transistor. Brush a generous amount of silicon compound such as Dow Coming No. 340 to completely cover both surfaces of the insulator (Part No. 16-9278-01). Place the insulator between the heat sink and the replacement transistor. Use the original transistor mounting hardware to mount the replacement transistor.

#### CAUTION

*All transistors are soldered to ensure maximum reliability. When soldering leads, use a heat sink (such as a small alligator clip) between the transistor and the source of heat).*

The above procedure may require some dismantling of the heat sink. It is therefore important to also clean the contact surface of the thermal breaker and to apply the silicon compound to the thermal breaker before reassembling the heat sink. Make certain the thermal breaker makes firm contact with the heat sink.

### REplacement PARTS

Most components used in the amplifier are standard parts available through reputable parts jobbers. The parts listed here may be obtained from Bogen distributors, service agencies or directly from the factory. When ordering a part, specify a part number, the model of the unit, and give the series designation, which is a letter followed by numbers, printed on the chassis. For parts on circuit boards, also give the component board assembly number, which begins with "45."

When replacing transistors, use those made by the specified manufacturers. Transistors from other suppliers may not be satisfactory. Certain resistors must be Allen-Bradley. These are designated by "AB" on the schematic diagram.

Schem. Ref.	Part No.	Description
<b>P.C. Board</b>		
—	45-7039	PC board assy.
C8, 10	79-008-046	Capacitor, electrolytic, 22 μF, 15V
C18, 21	79-008-049	Cap, electro, 500 μF, 35V
C19, 22	79-504-032	Cap, electro, 2.2 μF, 15V tant.
C31	79-112-001	Cap, electro, 500 μF, 65V
C32	79-008-058	Cap, electro, 10 μF, 50V
C33	79-008-062	Cap, electro, 100 μF, 50V
C39	79-112-015	Cap, electro, 2500 μF, 50V
CR2	96-5344-01	Diode, zener, 10V, 2W
CR3-5	96-5333-01	Diode, 400 piv @ 1A
Q1-4, 7, 10	96-5213-01 96-5346-01	Transistor, 2N5089
Q5	96-5298-01	Transistor, BC 239C
Q6	96-5283-01	Transistor, SPS-1910
Q8	96-5357-01	Transistor, MPS-A55
Q9	96-5356-01	Transistor, 2SD-389 (P)
R5, 8, 27, 30	77-001-711	Transistor, 2SB-512 (P)
R40, 48	75-842-561	Control, 1 megohm
R43, 46	77-001-734	Resistor, 560 ohm, 3W
R47	77-001-710	Control, 100 kilohm, coax.
R68, 69	76-107-096	Control, 200 kilohm
		Resistor, .82 ohm, 2W
<b>Chassis</b>		
C103	79-509-051	Cap, electro, 1500 μF, 75V (CHS-35A)
	79-509-052	Cap, electro, 2000 μF, 75V (CHS-60A)
	79-509-053	Cap, electro, 3000 μF, 75V (CHS-100A)
CB101	94-0017-04	Circuit breaker, .93A (35A)
	94-0017-09	Cir. breaker, 1.65A (60A)
	94-0017-15	Cir. breaker, 2.5A (100A)
CB102	94-0014-05	Thermal breaker, 105°C
CR101, 102	96-5241-01	Diode, 300 piv @ 3A
1101	94-0302-05	P.L. assy.
Q101- 104	96-5385-01	Transistor, 2N3055 H(RCA) or
R102,	96-5397-01	Transistor, 2N3055 (Solitron)
103	76-116-003	Resistor, .27 ohm, 7W (35A, 60A)
R102-5	76-116-003	Resistor, .27 ohm, 7W (100A)
R108	75-742-101	Resistor, 100 ohm, 7W
SW101	81-003-057	Switch, power, 3A (35A, 60A)
	81-003-053	Switch, power, 6A (100A)
T101	83-753-000	Transformer, power (35A)
	83-754-000	Transformer, power (60A)
	83-755-000	Transformer, power (100A)
T102	83-428-000	Transformer, output (35A)
	83-429-000	Transformer, output (60A)
	83-430-000	Transformer, output (100A)
—	03-0594-01	Knob
—	03-0649-01	Knob, rear coax.
—	03-0657-01	Knob, front coax.